The exploration and practice of SPOC based on the idea of *S+C+H*

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ABSTRACT: This article briefly describes the present situation with on-line higher education teaching in the information age. The author analyses the characteristics of the MOOC and SPOC, proposes and constructs a new model of on-line education in the post-MOOC period; namely, the teaching mode of SPOC based on - *self-directed learning - collaborative learning - hybrid learning* (*S+C+H*). Taking the teaching practice of an engineering graphics course as an example, the article displays the personalised *self-directed learning* mode with resource sharing, the *collaborative learning* mode with simultaneous joint teaching in different places and the *hybrid learning* model with flipped classes. The scope of the new model is that it will gradually break the traditional pattern of *cramming education*.

INTRODUCTION

With the rapid development of information technology, technologies such as multimedia and networks are exerting a revolutionary influence on higher education. Influenced by education ideals, which advocate free, shared and open education resources, massive open on-line courses (MOOCs) have emerged rapidly. One of the advantages of MOOCs is that they are easy to use with wide coverage and rich learning resources. However, there are also disadvantages, such as a high dropout rate and unsatisfactory teaching results. So, in the post-MOOC period, some new models of on-line learning are emerging, such as SPOCs (small private on-line courses), specific-people-oriented and small-scale private on-line courses, which limit enrolment numbers and conditions. Table 1 presents a comparison between MOOCs and SPOCs [1-5].

Table 1: Comparison between MOOCs and SPOCs.

Comparing item	Open or not	Limit number or not	Limit entrance condition or not	Typical examples
MOOC	Yes	No	No	Coursera, edX, Udacity, and so on
SPOC	Yes	Yes	Yes	Courses on *Copyright* of Harvard University, SPOC courses on *Engineering Graphics* of Chifeng University

Compared with MOOCs, SPOCs make the video integrate the whole process of teaching from the hybrid learning perspective through teaching design, course structure and evaluation, to make teachers come back to the campus, and promote teaching reform in universities. SPOCs have the advantage of small numbers, mainly for students on campus, but off-campus students can also be accepted for on-line learning [6]. They place more emphasis on exposing students to a complete and in-depth learning process and enhancing the learning motivation of students in order to improve the completion rates of the courses.

S+C+H - SPOC: A NEW MODE OF ON-LINE EDUCATION IN A POST-MOOC PERIOD

The *S+C+H* - SPOC teaching mode is based on the concept of independence, collaboration and mixture. Here, the letter *S* refers to the strategy of self-directed learning, that is to say, students make full use of rich and favourable on-line resources to meet the demand of personalised learning. The letter *C* refers to collaborative learning, a teaching strategy that organises teachers and students to cooperate in the form of a group, such as group collaboration and cross-class coordination, cross-campus collaboration, cross-university cooperation, coordination and collaboration between teachers and students, among students or among teachers. Cooperative learning makes individual teachers and students

integrate into teams. The letter *H* refers to hybrid learning, a strategy that blends teaching ideas of constructivism, behaviourism and cognitivism that integrates on-line and off-line learning, in-class and out-of-class learning, large-class lecturing and small flipped classes. The hybrid learning makes the classes in the same place at the same time become a class that can appear at anytime and anywhere.

The teaching mode of *S+C+H* - SPOC mainly serves university students on campus through integrating on-line and off-line teaching. That is to say, students watch on-line teaching videos at extracurricular times, and teachers use in-class time to discuss the key and difficult problems and strengthen practice, as well as consolidate the knowledge. At this time, teachers need to regulate the difficulty of the class flexibly and dynamically, and progress scoring criteria according to the requirements of students. Although *S+C+H* - SPOC uses the idea of SPOC for reference, it enjoys a much broader connotation for it contains three learning modes (self-directed learning, cooperative learning and hybrid learning) at the same time (see Figure 1).
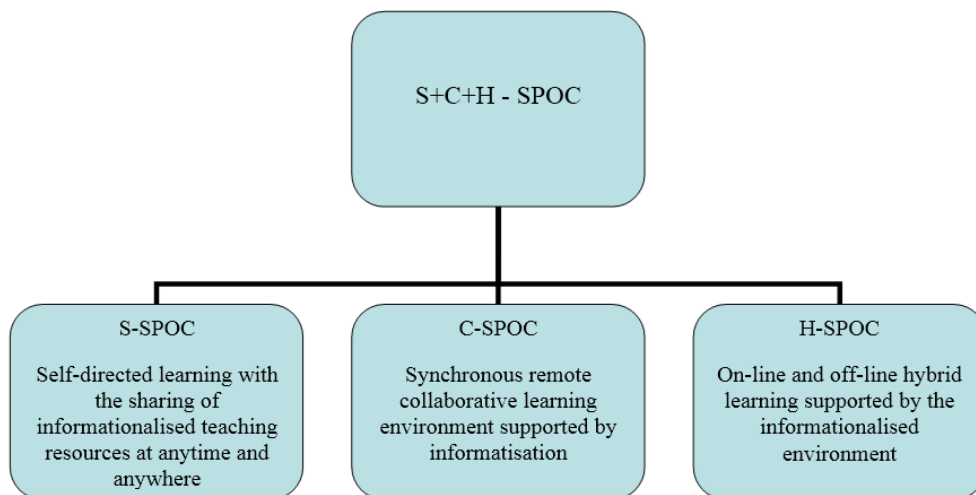

Figure 1: The content framework of *S+C+H* - SPOC.

Based on the independent, collaborative and hybrid teaching idea of *S+C+H* - SPOC, with guidance from the Commission of Teaching Instruction of Engineering Graphics of Higher Education of China, remote joint on-line teaching on *Engineering Graphics* was conducted through 21 lectures conducted 12 times, based on the video interaction centre platform of Chifeng University and the direct hardware access of five other universities in China. It offered video interaction classes and live broadcasts every Saturday evening from 11 October to 27 December in 2014. In 2015, the new and pilot teaching mode with independence, collaboration and hybrid will be continuously explored.

SELF-DIRECTED LEARNING WITH SHARING OF INFORMATIONALISED TEACHING RESOURCES AT ANYTIME AND ANYWHERE

Customised favourable teaching resources can be open and shared. The trend of on-line education and network education will stimulate more and more first-class universities to open their high-quality courses for free. In this way, students will no longer be confined to the classroom to acquire knowledge. Whether open teaching resources are superior or not can be decided on by the user's requirements for the sharing resource. In order to reflect the commonness of resource sharing and also adjust to the curriculum requirements of different universities, the mode of the learning platform has been adopted to ensure the coexistence of an *Engineering Graphics* MOOC platform and synchronous *Engineering Graphics* SPOC lessons.

The MOOC platform is open to all students of the universities involved with sharing resources, including the lecturers' teaching courseware, teaching videos, reflection questions and the advance notice for the next lesson. Students can raise questions to the lecturer on the discussion board or discuss with students from other colleges and universities. Personalised SPOC courses for students from different universities should be established. Given the teaching requirements, teaching progress and students' foundation of different colleges and universities, synchronous SPOC course groups constructed by SPOC courses offered by different universities can be established under the MOOC platform. So, one can keep the relative independence of the SPOC course of *Engineering Graphics* from different universities, but also synchronously share the remote course resources.

Personalised self-directed learning conditions will be offered. All the activities of education must start with mobilising students' initiative and enthusiasm. Different from the pure on-line teaching, on-line teaching of *S+C+H* - SPOC tends to present the expansion and perspectives of knowledge, as well as the connotation, and to pay attention to students' thinking development, ability training of analysing and solving problems, to change their passive learning situation gained from cramming classes and, finally, it provides beneficial conditions for students' personalised autonomous learning in terms of acquiring knowledge, expanding thinking and cultivating abilities. With the aid of the synchronous

SPOC course of each university, learners can take active part in learning activities on-line, such as on-line reflection questions, discussion topics, self-test questions, mutual evaluation for homework, which will help learners gain the initiative in learning, and develop their consciousness and ability for autonomic learning. At the same time, it can provide the basis for teachers to evaluate students' learning and give them feedback.

In off-line learning, students have the chance to discuss in groups. Though they passively accepted the knowledge in the past, they can now become active in learning. Meanwhile, the extracurricular self-test gives students a chance to see things from the perspective of teachers to independently design and assign questions, as well as self-testing, which gives full play to the students' subjective initiative.

Different students from different universities are required by their own teachers to adopt different ways to use on-line resources considering their teaching requirements off-line. For example, some universities ask their students to follow their progress, while other universities let their students voluntarily participate in on-line activities. The organic combination of on-line and off-line learning methods fully embodies the feature that it is students who decide the time and place and speed (the times they watch and playback speed) of learning, and independently decide on their personalised learning path.

THE SYNCHRONOUS REMOTE COLLABORATIVE LEARNING ENVIRONMENT SUPPORTED BY INFORMATISATION

The teaching environment based on multimedia and networks has changed the organisation and presentation of teaching information under the collaborative learning supported by the informatisation teaching environment. In remote simultaneous collaborative learning, the author invited 21 senior teachers from different universities to take on-line course teaching, and let them teach something they were good at to fulfil complementary advantages in order to make the most out of collaborative learning. The author also paid attention to the development and extension of knowledge, introduction of academic frontiers and training of thinking patterns to make a contribution to collaborative innovation. Each lecturer prepared their own teaching content, in which the wide range of knowledge and a large amount of information would broaden students' vision and promote their self-directed learning and thinking. Five universities had direct access to the class through hardware or software, and about 2,500 people benefited from it.

The informationalised teaching environment not only lays the foundation for upgrading the academic performance of learners through discussion, assistance and mutual promotion between learners, but it also provides favourable conditions for communication between learners and teachers or teachers and teachers.

Collaboration among Students

The teaching mode of $S+C+H$ - SPOC, which focuses on the learning theories of constructivism, combines on-line and off-line learning. The on-line learning is presented as remote and simultaneous collaborative learning, which crosses campuses and universities. The joint on-line teaching can help students experience the learning atmosphere of other campuses, colleges and universities through the network, and motivate students' learning enthusiasm. The on-line mutual evaluation of homework can even help in the organisation of competitions from which students can learn from each other. The off-line learning allows students to discuss, exchange ideas and raise problems in discussion. They can make correct conclusions after questioning and arguing in order to promote and improve the mutual learning atmosphere through flipped classes and group-cooperation learning.

Collaboration between Teachers and Students

The open network teaching platform serves as a good method for students and teachers to engage in cooperative communication. Teachers can directly encourage students to raise questions and express ideas on-line via long-distance teaching, and they can also answer questions through the Internet and carry out on-line interactive activities, such as topic discussion, homework feedback, and so on. In the off-line learning, classroom teaching becomes the teaching mode focusing on explaining, leading and discussing instead of the presentation and transmitting of knowledge. The fully understanding of learners' performance in the discussion and the team's overall evaluation makes teachers obtain teaching feedback objectively and efficiently. At the same time, the generative knowledge acquired from the discussion can be the first-hand information for teachers' teaching improvement and, thus, realising the mutual benefit of teaching and learning, and providing possibilities for the further improvement of teaching quality.

Collaboration between Teachers

Teachers can inspire and learn from each other through discussions during the preparation of lessons, viewing and emulating classes and summarising in discussion to realise the optimisation of teaching resources, as well as the coordinated development of teachers.

Anyhow, the on-line teaching mode of $S+C+H$ - SPOC does not mean learners will have isolated memory and practice, but will lead to collaborative learning and development between students, students and teachers and between teachers.

The collaboration between universities, campuses, teachers, teachers and students, and students is an all-round and multilevel collaboration. The effect of a collaborative community at this time is greater than simple overlap of the individual effect. Teachers and students not only benefit from these courses, but they also produce these courses. In this way, it greatly enhances the overall effect of collaborative learning.

ON-LINE AND OFF-LINE HYBRID LEARNING SUPPORTED BY THE INFORMATIONALISED TEACHING ENVIRONMENT

In the next one or two years, the education paradigm and situations is going to contain more on-line learning, hybrid learning and collaborative learning. Hybrid learning refers to the dynamic combination of the advantages between traditional teaching and digital teaching and learning in order to gain the learning mode, which embraces better a teaching effect. The teaching time and space is the combination of on-line lectures/videos and off-line face-to-face lectures. The teaching resources include on-line resources, such as on-line videos and text, and off-line classroom resources, such as physical resources and experiments. The learning objects contain learners in the same class or same university and learners from other campuses and universities. The learning results can be proved through getting credits or obtaining certificates [7-8]. Sometimes, there might even be occasions when students only want to obtain knowledge instead of striving for certificates.

Simultaneous and Remote On-line Collaborative Learning

Senior students from different colleges and universities use their carefully-prepared lectures to provide students from different universities with opportunities to attend lectures at the time they are being presented, and can also request the broadcast of the lectures at any time and place through the Internet. Learners are encouraged by teachers to teach and learn from each other on-line through on-line practice, small tests, mutual evaluation of homework and voting in BBS. In addition, in the simultaneous and remote joint teaching, teachers focus on giving hints rather than explaining everything, and leave enough space for students to explore, reduce the mechanical components in the process of teaching and increase instructional elements to enhance the students' learning motivation.

For the purpose of understanding the learning effect of the $S+C+H$ - SPOC education mode, students who participated in it were asked to answer pre-test and post-test questionnaires. 85% students felt *satisfied* or *almost satisfied* with the course teaching. And, most students agreed that *…the designed learning activities are helpful for them to achieve expected objectives of the course*, *…the teaching increased my interest in learning* and *…promoted my independent learning*. There are obvious changes in *information media literacy* and *creation and innovation abilities* when surveying for *…the influence on skills and abilities of students from course learning*, which indicates that the students' information media literacy and abilities of creation and innovation are improved through the pilot and reform teaching mode supported by information technology.

It can be seen that the hybrid learning under the education mode of $S+C+H$ - SPOC gives students opportunities to receive face-to-face guidance and advice from teachers in their universities, and experience lectures from teachers in other universities with their passion, characteristics and unique style. The combination of the space and time between the on-line remote teaching and off-line face-to-face teaching, the teaching resources between the on-line Internet resources and off-line classroom resources, and the cross-universities learners makes the focus of teaching change from teaching to learning, from in-class activities to in-class and out-of-class activities, from imparting knowledge to ability training and quality promotion, which greatly stimulates the mutual teaching and learning of teachers and students, and realises the dynamic complementary from multi-mode of the hybrid teaching mode.

CONCLUSIONS

The synchronous remote teaching witnessed teachers and students from five universities learning synchronously and these interactions brought new vision experience to students, improved their interest in learning, broadened each student's vision, and inspired the students' enthusiasm for self-directed learning. It not only realised the sharing of superior teaching resources, but also increased the learning and exchanges between teachers from different universities. In this way, it can guide and stimulate teachers to improve the level of teaching and teaching methods. Hence, the $S+C+H$ - SPOC education mode achieves wonderful performance in exploration and practice. However, there are some problems identified, which can be listed as follow:

1. The teaching effect of remote synchronous collaborative learning is confined by the network status and technical conditions. At present, there is a difference in classrooms, hardware products, and network environment of different universities. Sometimes the teaching effect and the real-time interaction in collaborative learning will be affected by the transmission.
2. Further optimisation and wiser choices will be needed in the design of teaching links and selection of the content. The links between each lecture need to be further optimised.
3. Learning materials and references in accordance with the characteristics of students in information age still need to be written.

At present, the cognitive structure of learners is being changed by new learning methods, such as global learning, mobile learning and life-long learning. The combination of information technology and higher education has become the inexorable trend of higher education informatisation.

Based on the idea of self-directed learning - collaborative learning - hybrid learning, the teaching mode of $S+C+H$ - SPOC contributes a lot to promoting the sharing of high-quality resources, stimulating students' personalised self-directed learning, advocating collaborative learning between teachers and students, strengthening the dynamic of multi-mode hybrid teaching. Meanwhile, higher requirements are proposed for teachers. They are required to turn themselves into the guide, promoter and evaluator rather than the traditional knowledge importer of concepts. They must dedicate themselves better to teaching, upgrade their digital media literacy, cultivate the thinking mode of the Internet era, attach importance to the establishment and rational utilisation of open and superior teaching resources, advance information-based teaching, strengthen the interaction in teaching practice, and integrate learning modes, such as on-line learning, collaborative learning and hybrid learning. Therefore, teaching in the information era not only means an improvement of teaching techniques and teaching methods, but also represents the revolution in the collaboration between students' learning and teachers' teaching.

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